Using Fuzzy Association Rule Algorithms to Enhance New Product Development

Student：Chuang-Cheng Chiu　　Advisor：Dr. Chieh-Yuan Tsai

Institute of Industrial Engineering and Management

Yuan-Ze University

ABSTRACT

In today's competitive market, consumer-oriented product development should be intensified to meet consumers' various requirements. If product designers can comprehend the preferences of the targeted consumers, the developed products will be remarkable and popular. Therefore, how to help designer understand and analyze consumers' favors becomes one of the most important tasks in new product development. Association rule algorithm, an essential technique in the data mining applications, can be used to find out the relation between consumers and products. Although generated association rules can help designers make a better design, most of association rule algorithms cannot generate the rules to reflect consumers' negative comments. In addition, association rules algorithms cannot handle numerical data. Most previous researches transform numerical data to categorical data in a subjective way. However, the approaches typically result in inaccurate association rules because of lacking an objective process.

To conquer the limitations mentioned above, this thesis provides a methodology to generate positive and negative association rules using fuzzy set theory. First, this research transforms consumers' demographic and preference data using fuzzy membership functions of respective fuzzy linguistic terms. This approach can improve the inappropriate categorization of numerical data. Then, a fuzzy transaction data-mining algorithm is applied to generate frequent itemsets of consumers' demographic and preference data. Finally, this thesis adopts positive and negative justification criteria to decide whether a frequent itemsets can be positive (or negative) rules or not. To show the feasibility, this study takes cellular phone products as an

example and establishes a fuzzy based product development system. The consumers' personal data and preferences are gathering with online questionnaires using web technology. Designers can change several parameter values of the system to generate variant association rules. With this system, designers can get more information for developing products that satisfy consumer's requirements.

Keywords: Data Mining, Association Rule, Negative Association Rule, Fuzzy Set, Product Design.